A B S T R A C T

[Abstract of the Disclosure]

Provided is a digital camera which displays a object while generating a digital image signal from light emitted from the object, stores the digital image signal in a user's memory card inserted into a memory card interface, and reproduces a start-signal, which is set up by the user, at the point of time when power is applied. The digital camera further includes a flash memory. Sound recording data inputted by the user, image data stored in the memory card, sound recording data stored in the flash memory, or image data stored in the flash memory is set up as a start-signal, and data about the set-up start-signal is stored in the flash memory.

[Representative Drawing]

FIG. 5

SPECIFICATION

[Title of the Invention]

DIGITAL CAMERA HAVING FLASH MEMORY FOR SETTING START-SIGNAL AND METHOD OF CONTROLLING THE DIGITAL CAMERA

[Brief Description of the Drawings]

FIG. 1 is a perspective view of the front external form of a digital camera according to the present invention;

FIG. 2 is a rear view of the rear external form of the digital camera of FIG. 1;

FIG. 3 shows an incidence side structure of the digital camera of FIG. 1;

FIG. 4 a block diagram of the entire structure of the digital camera of FIG. 1;

FIG. 5 shows screens on a display panel in start-sound & start-image setting steps performed in the digital camera of FIG. 4;

FIG. 6A is a flowchart for illustrating a start-image setting algorithm performed in the micro-controller of the digital camera of FIG. 4; and

FIG. 6B is flowchart for illustrating a start-sound setting algorithm performed in the micro-controller of the digital camera of FIG. 4.

< Explanation of Reference numerals designating the Major Elements of the Drawings >

1: digital camera	11; self-timer lamp
12: flash	13: shutter button
14: mode dial	15: function-selection button
16: photographing-information display unit	17a: view finder
18: function-block button	19: flash-light amount sensor
20: lens unit	21: external interface
31: power button	32: monitor button
33: auto-focusing lamp	34: flash standby lamp

35: display panel
36: OK/cancel button
37: enter/reproduction button
38: menu button
39w: wide angle zoom button
39t: telephoto-zoom button
40up: moving-up button
40ri: moving-right button
40lo: moving-down button
40le: moving-left button
OPS: optical system
41: filter unit
ZL: zoom lens
FL: focusing lens
CL: compensation lens
OLPF: optical low pass filter
IRF: infrared cut filter
OEC: photoelectric converter
M_Z: zoom motor
501: analog-to-digital converter
502: timing circuit
503: clock
504: dynamic random access memory
505: flash memory
506: memory card interface
507: digital signal processor
508: RS232C interface
509: video filter
21a: USB connector
21b: RS232C connector
21c: video output unit
510: lens driver
511: flash controller
512: micro-controller
INP: user input unit
LAMP: light emitting unit
513: audio processor
MIC: audio processor
SP: speaker
514: LCD driver
515: EEPROM
35: color LCD panel

[Detailed Description of the Invention]

[Object of the Invention]

[Technical Field of the Invention and Related Art prior to the Invention]

The present invention relates to a digital camera and a method of controlling the digital camera, and more particularly, to a digital camera which displays a object while generating a digital image signal from light emitted from the object, stores the digital

image signal in a user's memory card inserted into a memory card interface, and reproduces a start-signal, for example, a start-sound or a start-image, which is set up by the user, at the point of time when power is applied, and a method of controlling the digital camera.

Typical digital cameras include an optical system, a photoelectric converter, an analog-to-digital converter, a digital signal processor, a display device, a memory card interface, and a controller. The optical system optically processes light received from an object. The photoelectric converter converts the light received from the optical system into an analog electric signal. The analog-to-digital converter converts the analog signal received from the photoelectric converter into a digital signal. The digital signal processor processes the digital signal received from the analog-to-digital converter and provides the processed digital signal to a user. The display device displays the image of the object according to the digital image signal received from the digital signal processor. The user manipulates the digital camera so that the digital image signal output by the digital signal processor is stored in a memory card of the user via the memory card interface. The user manipulates the digital camera so that the digital image signal stored in the memory card is transmitted to the display device via the memory card interface and the digital signal processor. The controller controls the functions of components of the digital camera in response to a command signal received from the user.

In such a typical digital camera, for example, the digital camera disclosed in U.S. Patent No. 6,167,469, users must execute a specific program in a personal computer and download a start-sound or start-image, which is a start-signal, in order to set a new start-sound and a new start-image, which are start-signals reproduced when power is applied. Hence, setting a new start-signal is burdensome to users, and a desired start-signal cannot be promptly set upon photographing in the outside.

[Technical Goal of the Invention]

The present invention provides a digital camera which enables users to immediately set up a start-signal, thus increasing the convenience of users, and a method of controlling the digital camera.

[Structure and Operation of the Invention]

According to an aspect of the present invention, there is provided a digital camera which displays an object while generating a digital image signal from light emitted from the object, stores the digital image signal in a user's memory card inserted into a memory card interface, and reproduces a start-signal, which is set up by the user, at the point of time when power is applied, the digital camera further comprising a flash memory, in which sound recording data inputted by the user, image data stored in the memory card, sound recording data stored in the flash memory, or image data stored in the flash memory is set up as a start-signal, and data about the set-up start-signal is stored in the flash memory.

According to another present invention, there is provided a method of controlling a digital camera which displays a object while generating a digital image signal from light emitted from the object, stores the digital image signal in a user's memory card inserted into a memory card interface, and reproduces a start-signal, which is set up by the user, at the point of time when power is applied. This method includes a start-signal setting step and a start-signal storing step. In the start-signal setting step, sound recording data inputted by the user, image data stored in the memory card, sound recording data stored in the flash memory, or image data stored in the flash memory is set up as a start-signal. In the start-signal storing step, data about the set-up start-signal is stored in the flash memory.

In the digital camera according to the present invention and the method of controlling the digital camera, set-up data about a start-signal is stored in the flash memory. Also, sound recording data selected by a user, image data stored in the memory card, sound recording data stored in the flash memory, or image data stored in

the flash memory is set up as the start-signal. Since users can immediately set up a start-signal, convenience of users can increase.

Referring to FIG. 1, the front side of a digital camera 1 according to the present invention includes a self-timer lamp 11, a flash 12, a shutter button 13, a mode dial 14, a function-selection button 15, a photographing-information display unit 16, a view finder 17a, a function-block button 18, a flash-light amount sensor 19, a lens unit 20, an external interface 21, and a microphone (MIC).

The self-timer lamp 11 operates in a self-timer mode for a set period of time ranging from when the shutter button 13 is pressed down to when a shutter starts to operate. The mode dial 14 is used by a user to select and set up one of various modes, for example, a start-sound/image setting mode, a still image photographing mode, a night view photographing mode, a moving image photographing mode, a reproduction mode, a computer connection mode, and a system setting mode. The function-selection button 15 is used by the user to select one of the operating modes of the digital camera 1, for example, a still image photographing mode, a night view photographing mode, a moving image photographing mode, and a reproduction mode. The photographing-information display unit 16 displays a variety of photographing-related information. The function-block button 18 is used by the user to select a function if a state display panel which displays the operation status of each function exists. The digital camera 1 of FIG. 1 does not include a state display panel.

Referring to FIG. 2, the rear side of the digital camera 1 includes a power button 31, a monitor button 32, an auto-focusing lamp 33, a view finder 17b, a flash standby lamp 34, a display panel 35, a OK/cancel button 36, an enter/reproduction button 37, a menu button 38, a wide angle zoom button 39w, a telephoto-zoom button 39t, a moving-up button 40up, a moving-right button 40ri, a moving-down button 40lo, and a moving-left button 40le, and a speaker SP.

The monitor button 32 is used by the user to control the operation of the display panel 35. If the user presses down on the monitor button 32 at the first time after power is applied, the image of the object and information about the photographing of the

object are displayed on the display panel 35. If the user presses down on the monitor button 32 at the second time, only the image of the object is displayed on the display panel 35. If the user presses down on the monitor button 32 at the third time, power applied to the display panel 35 is stopped. The auto-focusing lamp 33 operates when it is in complete focus. The flash standby lamp 34 operates when the flash 12 of FIG. 1 is in an operation standby state. The OK/cancel button 36 is used as either an OK button or a cancel button while the user sets up each mode. The enter/reproduction button 37 is used by the user to input data or to achieve stop or reproduction in a reproduction mode. The menu button 3 is used to display a menu corresponding to a mode selected by the mode dial 14. The moving-up button 40up, the moving-right button 40ri, the moving-down button 40lo, and the moving-left button 40le are used while the user sets up each mode, similar to the OK/cancel button 36.

Referring to FIGS. 3 and 4, the entire structure of the digital camera 1 of FIG. 1 will now be described. An optical system OPS having the lens unit 20 and a filter unit 41 optically processes light emitted from an object.

The lens unit 20 includes a zoom lens ZL, a focusing lens FL, and a compensation lens CL.

When a user depresses the wide angle zoom button 39w of FIG. 2 or the telephoto zoom button 39t of FIG. 2, which are included in a user input unit INP, a signal corresponding to the wide angle zoom button 39w or the telephoto zoom button 39t is applied to a micro-controller 512. As the micro-controller 512 controls a lens driver 510, a zoom motor (M_Z) is driven, and the zoom lens ZL is moved. In other words, if the wide angle zoom button 39w is depressed, the focal length of the zoom lens ZL is shortened, and accordingly, an angle of view widens. If the telephoto zoom button 39t is depressed, the focal length of the zoom lens ZL increases, and accordingly, an angle of view narrows. Due this characteristic, the micro-controller 512 can obtain an angle of view with respect to the location of the zoom lens ZL from the data about the designing of the optical system OPS. Because the location of the focusing lens FL is

adjusted when the location of the zoom lens ZL has been set, the angle of view is hardly affected by the location of the focusing lens FL.

If the object is focused automatically or manually, the current location of the focusing lens FL varies depending on the location of the object. Hence, the micro-controller 512 can obtain the distance between the object and the focusing lens FL from the data for the design of the optical system OPS. In an automatic focusing mode, a focusing motor (M_F) is driven by the control of a lens driving unit 510 by the micro-controller 512. Accordingly, the focusing lens FL is moved from the very front to the very rear of its moving range. During this process, the location of the focusing lens FL, for example, the number of driving steps of the focusing monitor (M_F), where the greatest amount of radio frequency component of an image signal exists, is set up.

The compensation lens CL is not driven independently because it compensates for an overall refractive index. Reference character M_A denotes a motor for driving an aperture (not shown).

In the filter unit 41 of the optical system OPS, an optical low pass filter OLPF removes optical noise of the radio frequency component from incident light. An infrared cut filter IRF cuts an infrared component off from incident light.

The photoelectric converter OEC of a charge coupled device (CCD) or a complementary metal-oxide-semiconductor (CMOS) converts light emitted from the OPS into an electrical analog signal. A digital signal processor (DSP) 507 controls a timing circuit 502 to control the operations of the photoelectric converter OEC and a correlation double sampler and analog-to-digital converter (CDS-ADC) 501. The CDS-ADC 501 processes an analog signal received from the photoelectric converter OEC to remove radio frequency noise from the analog signal, adjust the amplitude of the analog signal, and convert the resulting analog signal into a digital signal. The DSP 507, which operates under the control of the micro-controller 512, processes a digital signal received from the CDS-ADC 501 so that the digital signal is divided into a luminance signal and a chrominance signal.

A light emitting unit LAMP, which is driven by the micro-controller 512, includes a self-timer lamp 11, the auto-focusing lamp 33 of FIG. 2, and the flash standby lamp 34 of FIG. 2. The user input unit INP includes the shutter button 13 of FIG. 1, the mode dial 14 of FIG. 1, the function-selection button 15 of FIG. 1, the function-unit button 18 of FIG. 1, the monitor button 32 of FIG. 2, the OK/cancel button 36 of FIG. 2, the enter/reproduction button 37 of FIG. 2, the menu button 38 of FIG. 2, the wide angle zoom button 39w of FIG. 2, the telephoto-zoom button 39t of FIG. 2, the moving-up button 40up of FIG. 2, the moving-right button 40ri of FIG. 2, the moving-down button 40lo of FIG. 2, and the moving-left button 40le of FIG. 2.

A dynamic random access memory (DRAM) 504 temporarily stores the digital image signal received from the DSP 507. An electrically erasable programmable read only memory (EEPROM) 515 stores algorithms and setup data, which are necessary for the operation of the DSP 507. A memory card of a user is attached to or detached from a memory card interface 506.

The digital image signal output from the DSP 507 is applied to an LCD driver 514, and accordingly, an image is displayed on a color LCD panel 35.

Alternatively, the digital image signal output from the DSP 507 can be transmitted in a serial communication manner via either a universal serial bus (USB) connector 21a or an RS232C interface 508 and its connector 21b. Alternatively, the digital image signal output from the DSP 507 may pass through a video filter 509 and a video output unit 21c and be transmitted as a video signal.

An audio processor 513 outputs an audio signal received from a microphone MIC to the DSP 507 or a speaker SP and outputs the audio signal received from the DSP 507 to the speaker SP.

Meanwhile, the micro-controller 512 controls the operation of a flash controller 511 according to a signal received from the flash-light amount sensor 19 of FIG. 1 and drives the flash 12 of FIG. 1.

A flash memory 505 stores start-sound data and start-image data, which are set every time a start-sound signal and a start-image signal are set by a user, using a

first-in first-out (FIFO) method. Sound recording data selected by a user, image data stored in a memory card, sound recording data stored in a flash memory, or image data stored in the flash memory can be set up as the start-sound signal or the start-image signal. Contents related to the start-sound data and start-image data will be described in detail later. The start-sound data and start-image data stored in the flash memory 505 can be deleted by the user.

Referring to FIGS. 1, 2, and 5, pictures of the display panel 35 varying depending on start-sound and start-image setting steps, which are performed in the digital camera of FIG. 4, will now be described in sequence.

When a user selects a start-sound/start-image setting mode using the mode dial 14 and presses down on the menu button 38, a picture P10 for selecting either a start-sound or a start-image, which are start-signals, is displayed on the color LCD panel 35.

Next, when the user selects the "start-image" using the moving-up button 40up or the moving-down button 40lo and presses down on the OK/cancel button 36, a menu screen P20 for setting a start-image is displayed. In the picture P20, "1. Mountain", "2. Flower", and "3. Designation 1" denote menus which have been set as start-images, stored in the flash memory 505, and classified by the user. Accordingly, when the user selects one item, for example, "4. Memory Card", using the moving-up button 40up or the moving-down button 40lo and presses down on the OK/cancel button 36, a menu picture P21 composed of reduced pictures P21a for images stored in a memory card is displayed. Thereafter, when the user selects one reduced picture P21a using the moving-up button 40up, the moving-right button 40ri, the moving-down button 40lo, and the moving-left button 40le and presses down on the OK/cancel button 36, a magnified picture P22 for confirming the setup of the image corresponding to the above selected picture is displayed. If the user selects "Yes" using the moving-up button 40up and the moving-down button 40lo and presses down on the OK/cancel button 36, he or she can set up the image of the confirmed picture, as a start-image.

When the picture P10 is displayed on the color LCD panel 35, if the user selects a start-sound using the moving-up button 40up or the moving-down button 40lo and presses down on the OK/cancel button 36, a menu picture P30 for setting up the start-sound is displayed. In the picture P30, "1. Bird sound" and "2. Melody" denote menus which have been set as start-sounds, stored in the flash memory 505, and classified by the user. When the user selects one item, for example, "3. New sound", using the moving-up button 40up or the moving-down button 40lo and presses down on the OK/cancel button 36, a picture P31 showing a message "record the sound" is displayed. When the user records the selected sound using the MIC and presses down on the OK/cancel button 36, a magnified picture P32 for confirming the setup of the selected sound is displayed while the recorded sound is being reproduced through the SP. If the user selects "Yes" using the moving-up button 40up and the moving-down button 40lo and presses down on the OK/cancel button 36, he or she can set up the recorded sound as a start-sound.

Referring to FIGS. 4, 5, and 6A, a start-image setting algorithm performed in the micro-controller 512 of the digital camera of FIG. 4 will now be described step by step. When the micro-controller 512 receives a start-image setting request via the INP, it performs a start-image setting algorithm of FIG. 6A.

First, in step S60, the picture P20 showing types of start-image to be set up is displayed.

Next, if the user selects a setup of an image stored in the memory card using the moving-up button 40up or the moving-down button 40lo in step S61, the menu picture P21 composed of reduced pictures for images stored in the memory card is displayed, in step S631. Thereafter, when the user selects one reduced picture P21a using the moving-up button 40up, the moving-right button 40ri, the moving-down button 40lo, and the moving-left button 40le and presses down on the OK/cancel button 36, the magnified picture P22 for confirming the setup of the image corresponding to the above selected picture is displayed. If the user selects "Yes" using the moving-up button 40up and the moving-down button 40lo and presses down on the OK/cancel button 36

in step S632, data about the selected image is stored in the flash memory 505 and set up as a start-image, in step S633.

On the other hand, if the user selects a setup of an image stored in the flash memory 505 using the moving-up button 40up or the moving-down button 40lo in step S61, a menu picture composed of reduced pictures for images stored in flash memory 505 is displayed, in step S621. Thereafter, when the user selects one reduced picture using the moving-up button 40up, the moving-right button 40ri, the moving-down button 40lo, and the moving-left button 40le and presses down on the OK/cancel button 36, the magnified picture P22 for confirming the setup of the image corresponding to the above selected picture is displayed. If the user selects "Yes" using the moving-up button 40up and the moving-down button 40lo and presses down on the OK/cancel button 36 in step S622, data about the selected image is set up as a start-image, in step S623.

Referring to FIGS. 4, 5, and 6B, a start-sound setting algorithm performed in the micro-controller 512 of the digital camera of FIG. 4 will now be described step by step. When the micro-controller 512 receives a start-sound setting request via the INP, it performs a start-sound setting algorithm of FIG. 6B.

First, in step S64, the picture P30 showing types of start-sounds to be set up is displayed.

Next, when the user selects a setup of a sound stored in the flash memory 505, using the moving-up button 40up or the moving-down button 40lo in step S65, a menu picture showing sounds stored in the flash memory 505 is displayed, in step S661. Thereafter, when the user selects one sound using the moving-up button 40up, the moving-right button 40ri, the moving-down button 40lo, and the moving-left button 40le and presses down on the OK/cancel button 36 in step S662, the magnified picture P32 for confirming the setup of the selected sound is displayed while the selected sound is being reproduced in step S663. If the user selects "Yes" using the moving-up button 40up and the moving-down button 40lo and presses down on the OK/cancel button 36 in step S664, data about the selected sound is set up as a start-sound, in step S665.

After the step 64, in which the picture P30 showing types of start-sounds to be set up is displayed, if the user selects sound recording using the moving-up button 40up or the moving-down button 40lo in step S65, the picture P31 showing a message "record the sound" is displayed, and a selected sound is recorded, in step S671. After the recording is completed, the magnified picture P32 for confirming the setup of the selected sound is displayed while the recorded sound is being reproduced in step S672. If the user selects "Yes" using the moving-up button 40up and the moving-down button 40lo and presses down on the OK/cancel button 36 in step S673, data about the selected sound is stored in the flash memory 505 and set up as a start-sound, in step S674.

While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims.

[Effect of the Invention]

As described above, in a digital camera according to the present invention and a method of controlling the digital camera, set-up data about a start-image signal or a start-sound signal is stored in a flash memory. Also, sound recording data selected by a user, image data stored in a memory card, sound recording data stored in the flash memory, or image data stored in the flash memory is set up as the start-sound signal or the start-image signal. Since the user can immediately set up a start-sound and a start-image, convenience of users can increase.

What is claimed is:

1. A digital camera which displays a object while generating a digital image signal from light emitted from the object, stores the digital image signal in a user's memory card inserted into a memory card interface, and reproduces a start-signal, which is set up by the user, at the point of time when power is applied, the digital camera further comprising a flash memory, in which sound recording data inputted by the user, image data stored in the memory card, sound recording data stored in the flash memory, or image data stored in the flash memory is set up as a start-signal, and data about the set-up start-signal is stored in the flash memory.

2. A method of controlling a digital camera which displays a object while generating a digital image signal from light emitted from the object, stores the digital image signal in a user's memory card inserted into a memory card interface, and reproduces a start-signal, which is set up by the user, at the point of time when power is applied, the method comprising:

setting up as a start-signal sound recording data inputted by the user, image data stored in the memory card, sound recording data stored in the flash memory, or image data stored in the flash memory; and

storing data about the set-up start-signal in the flash memory.

3. The method of claim 2, wherein in the start-signal setting step, if the start-signal is a start-image, a list of images stored in either the memory card or flash memory selected by the user is presented, and an image selected by the user is set up as the start-image.

4. The method of claim 2, wherein in the start-signal setting step, if the start-signal is a start-sound, the user selects either to present a list of sounds stored in the flash memory or to receive sound-recording data from the user, and either the input sound-recording data or a sound selected by the user is set up as the start-sound.

5. The method of claim 2, wherein in the storing step, when an image stored in the memory card or sound-recording data received from the user is set up as the start-signal in the start-signal setting step, the set-up start-signal is stored in the flash memory.

FIG. 1

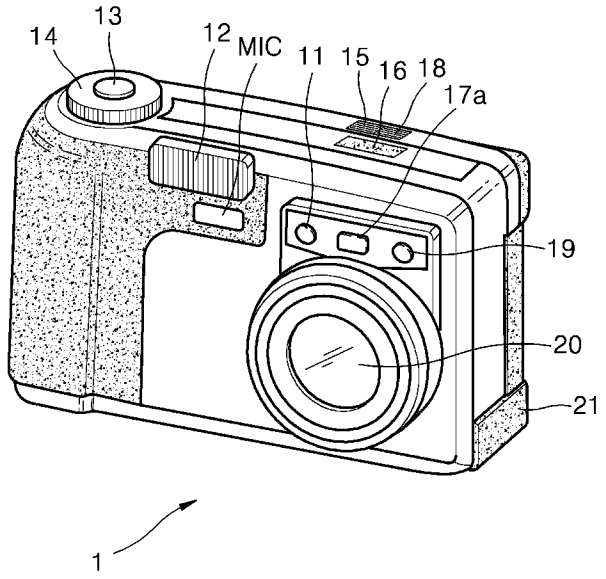

14
13
12
MIC
11
15
16
18
17a
19
20
21
1

FIG. 2

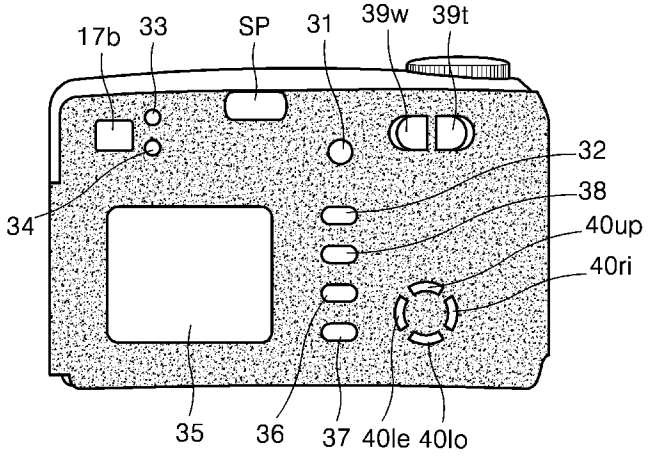
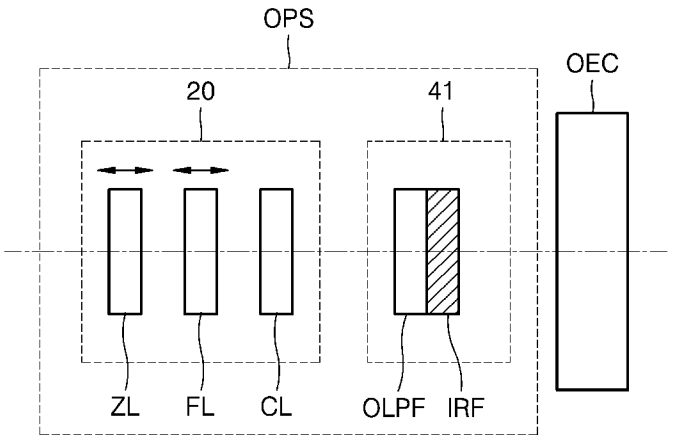

17b
33
SP
31
39w
39t
32
38
40up
40ri
34
35
36
37
40le
40lo

FIG. 3



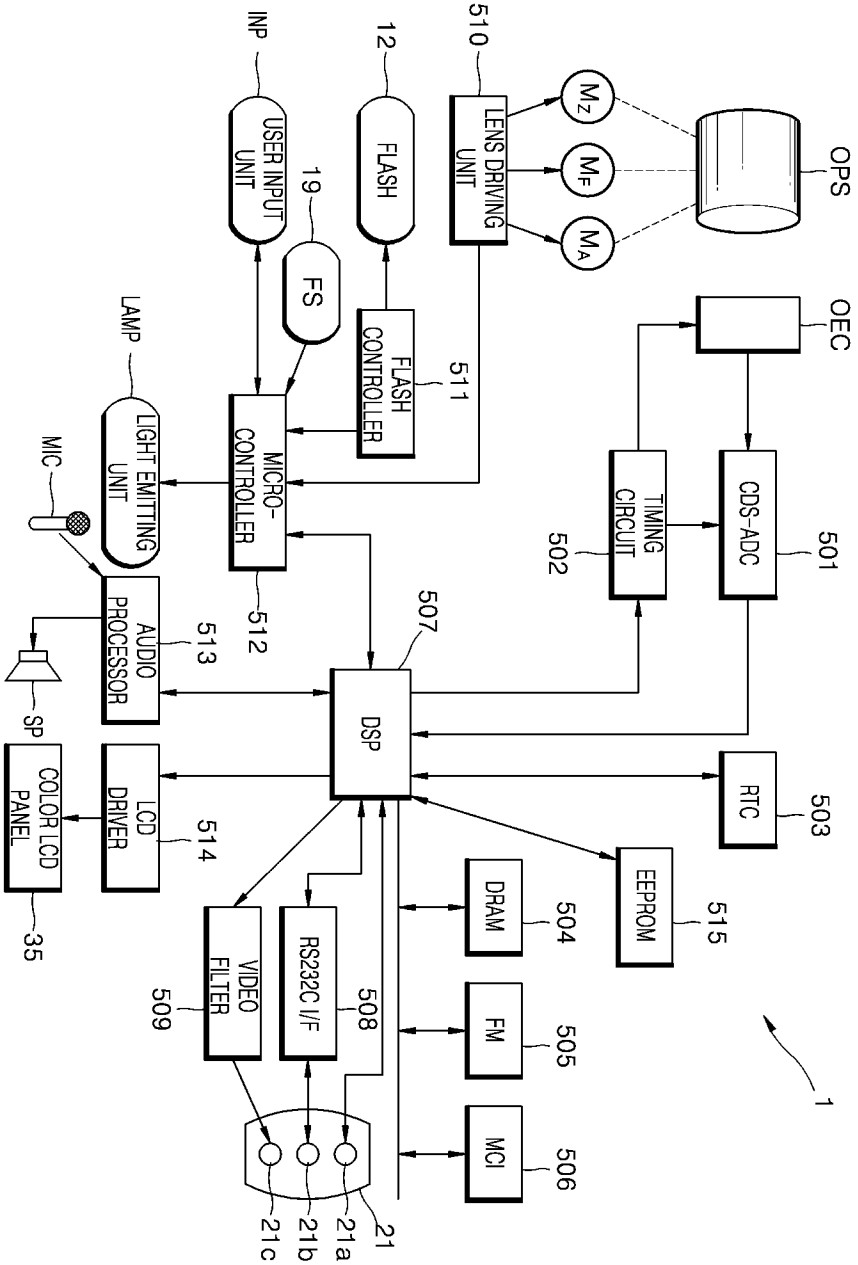
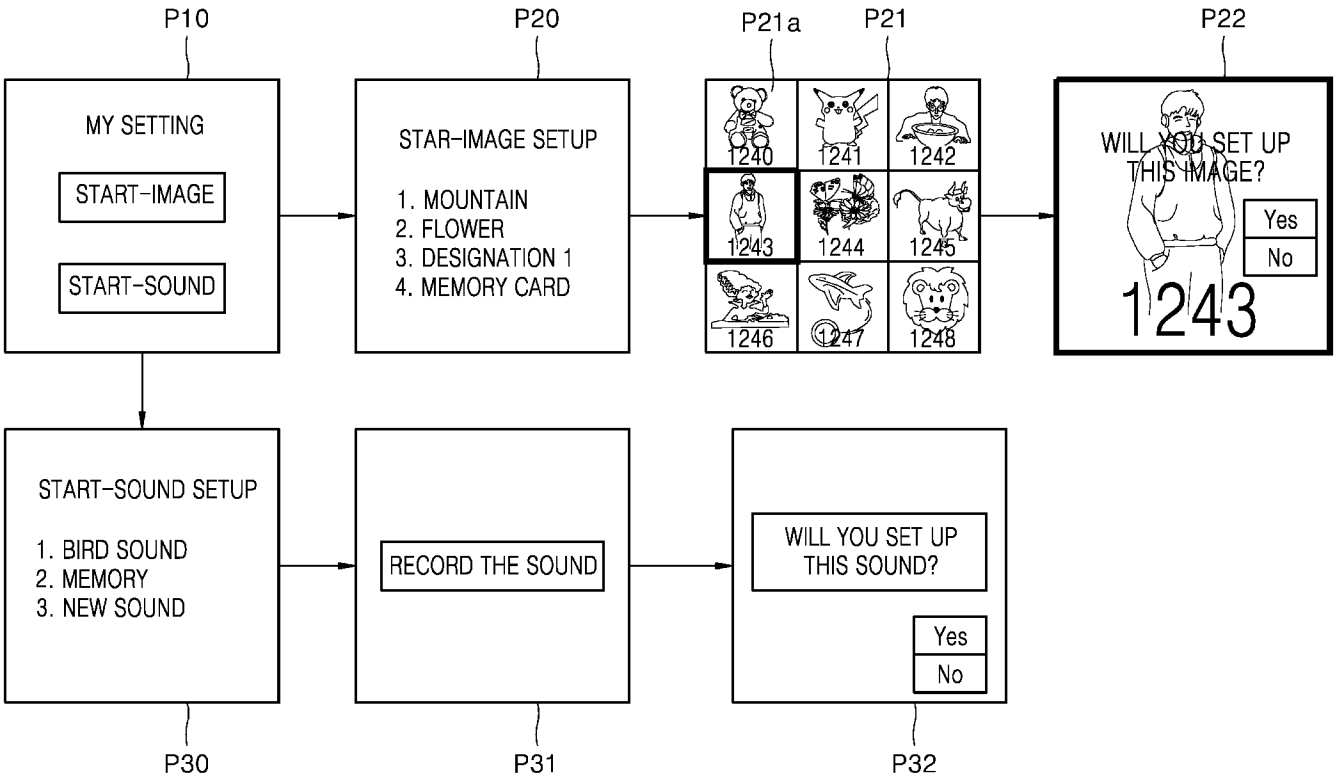

OPS
OEC
CDS-ADC
501
TIMING CIRCUIT
502
LENS DRIVING UNIT
510
FLASH
12
FLASH CONTROLLER
511
USER INPUT UNIT
INP
FS
19
MICRO-CONTROLLER
512
LAMP
LIGHT EMITTING UNIT
MIC
AUDIO PROCESSOR
513
SP
DSP
507
RTC
503
EEPROM
515
DRAM
504
FM
505
MCI
506
LCD DRIVER
514
COLOR LCD PANEL
35
VIDEO FILTER
509
RS232C I/F
508
21
21a
21b
21c
1

FIG. 4

FIG. 5


P10
P20
P21a
P21
P22
MY SETTING
START-IMAGE
START-SOUND
STAR-IMAGE SETUP
1. MOUNTAIN
2. FLOWER
3. DESIGNATION 1
4. MEMORY CARD
1240
1241
1242
1243
1244
1245
1246
1247
1248
WILL YOU SET UP THIS IMAGE?
Yes
No
1243
START-SOUND SETUP
1. BIRD SOUND
2. MEMORY
3. NEW SOUND
RECORD THE SOUND
WILL YOU SET UP THIS SOUND?
Yes
No
P30
P31
P32

20

FIG. 6A

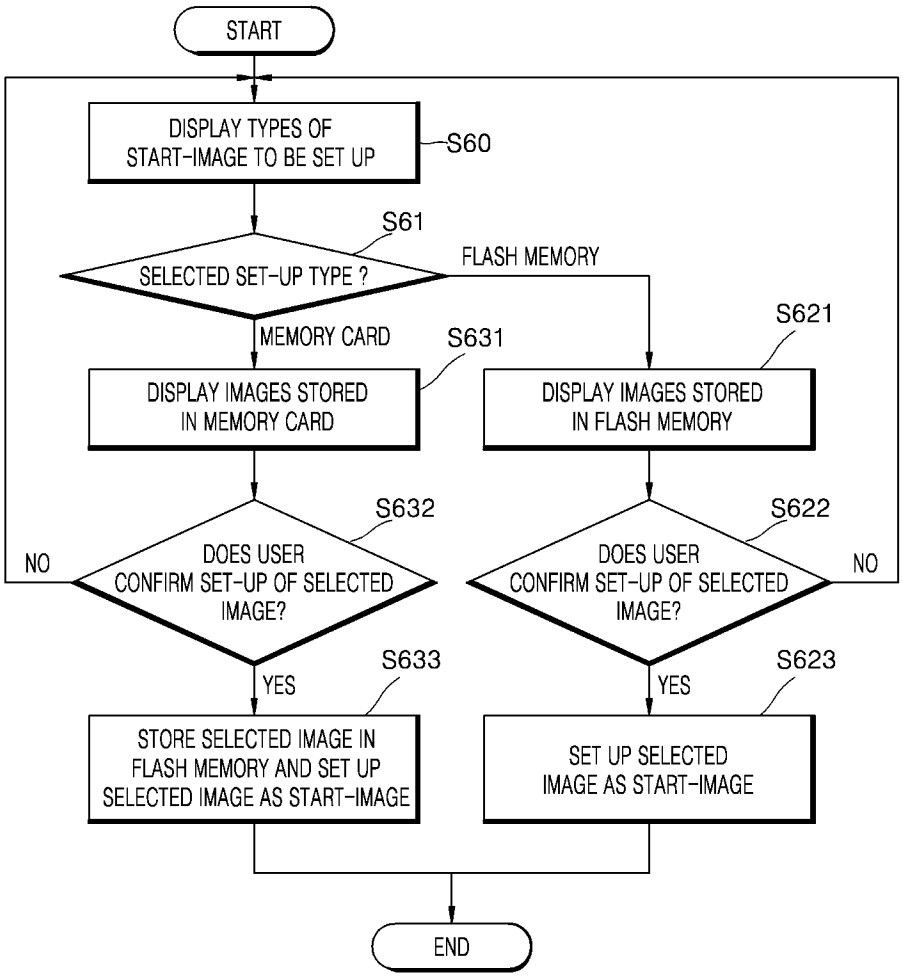
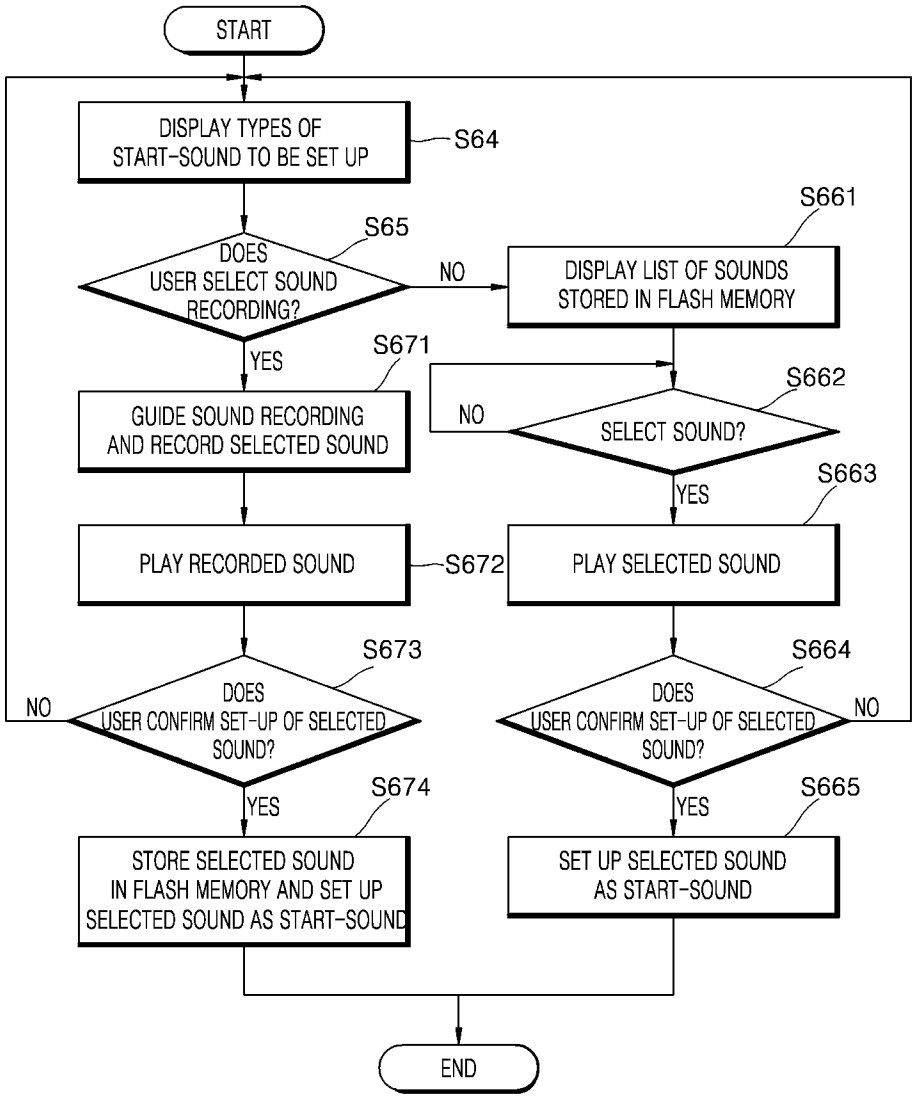

START
DISPLAY TYPES OF START-IMAGE TO BE SET UP
S60
S61
SELECTED SET-UP TYPE ?
FLASH MEMORY
MEMORY CARD
S631
S621
DISPLAY IMAGES STORED IN MEMORY CARD
DISPLAY IMAGES STORED IN FLASH MEMORY
S632
S622
NO
DOES USER CONFIRM SET-UP OF SELECTED IMAGE?
DOES USER CONFIRM SET-UP OF SELECTED IMAGE?
NO
S633
S623
YES
YES
STORE SELECTED IMAGE IN FLASH MEMORY AND SET UP SELECTED IMAGE AS START-IMAGE
SET UP SELECTED IMAGE AS START-IMAGE
END

FIG. 6B


START
DISPLAY TYPES OF START-SOUND TO BE SET UP
S64
S65
DOES USER SELECT SOUND RECORDING?
NO
YES
S661
DISPLAY LIST OF SOUNDS STORED IN FLASH MEMORY
S671
GUIDE SOUND RECORDING AND RECORD SELECTED SOUND
S662
NO
SELECT SOUND?
YES
S663
PLAY RECORDED SOUND
S672
PLAY SELECTED SOUND
S673
DOES USER CONFIRM SET-UP OF SELECTED SOUND?
NO
YES
S664
DOES USER CONFIRM SET-UP OF SELECTED SOUND?
NO
YES
S674
STORE SELECTED SOUND IN FLASH MEMORY AND SET UP SELECTED SOUND AS START-SOUND
S665
SET UP SELECTED SOUND AS START-SOUND
END